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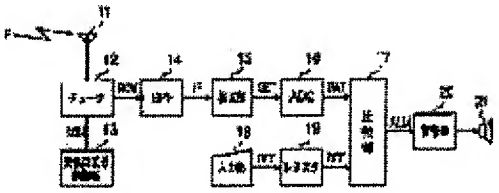
(54) ALARM DEVICE AND SYSTEM FOR OBSTRUCTIVE ELECTRIC WAVE

(57)Abstract:

PROBLEM TO BE SOLVED: To provide a portable alarm device for obstructive electric waves which detects obstructive electric waves causing wrong operation of a heart pacemaker, etc., and a system for controlling generation of electric waves from sources such as a cellular phone, etc., near a medical equipment user.

SOLUTION: Electric waves F inputted to a tuner 12 by way of an antenna 11 are selected one by one with scanning signals SCN from a received frequency control part 13, and received signals RCV are produced and outputted to the BPF 14. The intermediate frequency signals 1F passing through the BPF 14 are inputted to an wave detecting part 15, and detection signals DET are produced in proportion to the amplitude. The detection signals DET are converted to digital measuring data DAT at ADC 16, and are compared with standard values REF saved at a register 19 at a comparing part 17. If the measuring data DAT exceed the standard values REF, an alarm signal ALM is outputted and alarm sound is outputted through an alarm part 20 and a speaker 21.



* NOTICES *

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CLAIMS

[Claim(s)]
[Claim 1]A reception means which receives a radio signal of a predetermined frequency range one by one based on a scanning signal, A level detection means which detects a signal level of a radio signal received by said reception means, An analog-to-digital conversion means to change into digital value a signal level detected by said level detection means, and to output as measurement data, A fault-radio-waves warning device provided with a comparison means in comparison with a reference value beforehand set up in said measurement data, and a warning means which emits warning by vibration, sound, or synthesized speech when judged with a value of said measurement data being over said reference value by said comparison means.
[Claim 2]The fault-radio-waves warning device according to claim 1, wherein said comparison means has an input part for setting up this reference value to a storage parts store and this storage parts store for holding said reference value.
[Claim 3]A fault-radio-waves warning system comprising:
A fault-radio-waves warning device which has a transmitting means which transmits an alarm signal by specific frequency of a level lower than a reference value.
A transmission and reception means to have a radio-transmission-and-reception device, and for said radio-transmission-and-reception device transmit and receive a radio signal of a predetermined frequency range.
A reception means for receiving said alarm signal.
A transmission control means which reduces a level of a radio signal transmitted from said transmission and reception means below on a predetermined level, or forbids transmission from this transmission and reception means when said alarm signal is received.

[Claim 4]A fault-radio-waves warning system comprising:

A reception means in which a fault-radio-waves warning device in the fault-radio-waves warning system according to claim 3 receives a radio signal of a predetermined frequency range one by one based on a scanning signal.
A level detection means which detects a signal level of a radio signal received by said reception means.
An analog-to-digital conversion means to change into digital value a signal level detected by said level detection means, and to output as measurement data.
Said transmitting means which transmits an alarm signal by specific frequency of a level lower than this reference value when judged with a value of said measurement data being over said reference value by comparison means in comparison with a reference value beforehand set up in said measurement data, and said comparison means.

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DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention]This invention relates to the fault-radio-waves warning device and fault-radio-waves warning system for detecting and warning of, for example, the electric wave which a portable telephone etc. discharge doing an obstacle to medical equipment, such as an artificial cardiac pacemaker.
[0002]
[Description of the Prior Art]In recent years, the spread of portable radio-transmission-and-reception devices, such as a portable telephone, is remarkable. Although it is portable therefore, it can use always anywhere, and a user's morals are posing a problem. Problems, such as producing malfunction to these apparatus, are pointed out by discharging a powerful electric wave near the apparatus to affect a life like the artificial cardiac pacemaker especially embedded in the medical equipment and the human body of a hospital. On the other hand, measures exist only the method of making enough the electric wave shield of the near apparatus which receives an obstacle at present, and the method which has appealed for prohibition of use in a hospital to owners, such as a portable telephone, enough, and carries out it to them. The actual condition is especially the artificial cardiac pacemaker embedded in a human body having a limit in an electric wave shield, and surrounded always anywhere by the danger by the fault radio waves which must have been perceived in human being's senses.
[0003]
[Problem(s) to be Solved by the Invention]Those who use the medical equipment which has fear of malfunction to fault radio waves carry this invention, The fault-radio-waves warning system for making discharge of the powerful electric wave of transmitters, such as a portable telephone, control near those who use the fault-radio-waves warning device for detecting existence of fault radio waves and medical equipment is provided.

[0004]
[Means for Solving the Problem]In order to solve said technical problem, the 1st invention of this inventions is provided with the following.
For example, a reception means which receives a radio signal of a predetermined frequency range one by one based on a scanning signal in a fault-radio-waves warning device carried in order that a user of an artificial cardiac pacemaker, etc. may avoid influence from fault radio waves.
A level detection means which detects a signal level of a radio signal received by said reception means.
An analog-to-digital conversion means to change into digital value a signal level detected by said level detection means, and to output as measurement data.
A comparison means in comparison with a reference value beforehand set up in said measurement data, and a warning means which emits warning by vibration, sound, or synthesized speech when judged with a value of said measurement data being over said reference value by said comparison means.
The 2nd invention has provided an input part for setting this reference value as a comparison means in a fault-radio-waves warning device of the 1st invention to a storage parts store and this storage parts store for holding said reference value.
[0005]In a fault-radio-waves warning system with which the 3rd invention was provided with a fault-radio-waves warning device which a user of an artificial cardiac pacemaker, etc. carry, and a radio-transmission-and-reception device which may do fault radio waves to this artificial cardiac pacemaker, for example, This fault-radio-waves warning device has a transmitting means which transmits an alarm signal by a specific radio frequency of a level lower than a reference value.A radio-transmission-and-reception device is provided with the following.
A transmission and reception means for transmitting and receiving a radio signal of a predetermined frequency range.
A reception means for receiving said alarm signal.
A transmission control means which reduces a level of a radio signal transmitted from said transmission and reception means below on a predetermined level, or forbids transmission from this transmission and reception means when said alarm signal is received.
The 4th invention is provided with the following.
A reception means which receives a radio signal of a predetermined frequency range one by one to a fault-radio-waves warning device in the 3rd invention based on a scanning signal.
A level detection means which detects a signal level of a radio signal received by said reception means.
An analog-to-digital conversion means to change into digital value a signal level detected by said level detection means, and to output as measurement data.

A comparison means in comparison with said reference value beforehand set up in said measurement data, and said transmitting means which is judged as a value of said measurement data being over said reference value by said comparison means, and transmits an alarm signal by specific frequency of a level lower than this reference value at the time of ****.

[0006]Since a fault-radio-waves warning device was constituted as mentioned above according to the 1st invention, the following operations are performed. A signal level of a radio signal which a radio signal of a predetermined frequency range was received one by one by reception means, and was received by a level detection means is detected, and also measurement data changed into digital value by an analog-to-digital conversion means is obtained. Measurement data is compared with a reference value set up beforehand by comparison means, and if judged with this measurement data being over a reference value, warning by vibration, sound, or synthesized speech will be emitted from a warning means. According to the 2nd invention, the following operations are performed. A reference value set up by input part is held at a storage parts store, and a judgment of measurement data is performed in a comparison means based on this held reference value. Since a fault-radio-waves warning system was constituted as mentioned above according to the 3rd invention, the following operations are performed.

[0007]From a transmitting means of a fault-radio-waves warning device, an alarm signal by a radio frequency of a level lower than a reference value is transmitted. And reception of this alarm signal of a reception means of a radio-transmission-and-reception device will forbid a radio signal for which a level of a radio signal transmitted from a transmission and reception means is reduced by below predetermined level or which is transmitted by transmission control means from a transmission and reception means. According to the 4th invention, the following operations are performed. A signal level of a radio signal which a radio signal of a predetermined frequency range was received one by one by reception means of a fault-radio-waves warning device, and was received by a level detection means is detected, and also measurement data changed into digital value by an analog-to-digital conversion means is obtained. Measurement data is compared with a reference value set up beforehand by comparison means, and if judged with this measurement data being over a reference value, an alarm signal by a radio frequency of a level lower than a reference value will be transmitted from a warning means. And reception of this alarm signal of a reception means of a radio-transmission-and-reception device will forbid a radio signal for which a level of a radio signal transmitted from a transmission and reception means is reduced by below predetermined level or which is transmitted by transmission control means from a transmission and reception means.

[0008]

[Embodiment of the Invention]

The 1st embodiment drawing 1 is a lineblock diagram of the fault-radio-waves warning device in which a 1st embodiment of this invention is shown. This fault-radio-waves warning device is carried in order that those who are using the artificial cardiac pacemaker may, for example, avoid danger, such as malfunction of the artificial cardiac pacemaker by powerful electromagnetic waves. This fault-radio-waves warning device has the antenna 11 for receiving the electric wave F acting as an obstacle. The reception means (for example, the tuner 12 and the received frequency control section 13) is connected to the antenna 11. The tuner 12 chooses the frequency of the 800 MHz bands which are for choosing the electric wave of specific frequency out of the electric wave F received with the antenna 11, for example, are used with a cellular phone etc., 1.9 GHz bands, etc. based on scanning signal SCN. That is, the received frequency control section 13 is connected to the tuner 12, and based on scanning signal SCN given from this received frequency control section 13, the electric wave F inputted from the antenna 11 is changed into input-signal RCV of an intermediate frequency (for example, 10.7 MHz), and is outputted. The band-pass filter (henceforth "BPF") 14 is connected to the output side of the tuner 12. BPF14 passes only the signal of a specific frequency range (for example, 10.7**0.1 MHz) of input-signal RCV given from the tuner 12 as intermediate frequency signal IF, and the level detection means (for example, detection section) 15 is connected to this output side.

[0009]The detection section 15 detects intermediate frequency signal IF which passed BPF14, and generates the detection signal DET proportional to the amplitude. The output side of the detection section 15 is connected to the input side of the analog-to-digital conversion means (for example, an analog-to-digital conversion machine and henceforth ["ADC"]) 16. ADC16 samples the inputted detection signal DET with a constant period, changes the sampled pressure value into digital value, and outputs it as measurement data DAT. The output side of ADC16 is connected to the 1st input side of the comparison means (for example, comparing element) 17. This fault-radio-waves warning device has the input part 18 for setting up the reference value REF which judges whether the intensity of the received electric wave F is a safe value, or it is a dangerous value. The input part 18 has a function which can choose a suitable value with a push-button switch etc. according to an operating environment etc. from two or more reference values REF, for example. The reference value REF set up by the input part 18 is held at the storage parts store (for example, register) 19. The output side of the register 19 is connected to the 2nd input side of said comparing element 17. The comparing element 17 compares measurement data DAT given from ADC16 with the reference value REF held at the register 19, and when judged with this measurement data DAT being over the reference value REF, it outputs the alarm signal ALM. The output side of the comparing

element 17 is connected to the warning means (for example, the alarm part 20 and the loudspeaker 21). The alarm part 20 outputs an alarm signal based on the alarm signal ALM given from the comparing element 17. The loudspeaker 21 for outputting a beep sound to those who are carrying this fault-radio-waves warning device is connected to the output side of the alarm part 20.

[0010]Next, operation is explained. The electric wave F which has two or more frequency components is inputted into the tuner 12 via the antenna 11 of a fault-radio-waves warning device. In the tuner 12, the specific frequency component of the inputted electric waves F is chosen by scanning signal SCN given from the received frequency control section 13, is changed into input-signal RCV of a fixed intermediate frequency (10.7 MHz), and is outputted to BPF14. In BPF14, only the frequency component of the fixed range (**100 kHz) centering on the intermediate frequency of 10.7 MHz is passed, and it is outputted to the detection section 15 as intermediate frequency signal IF. Intermediate frequency signal IF is detected in the detection section 15, and the detection signal DET proportional to the amplitude is generated. The detection signal DET is given to ADC16, is changed into digital value and given to the comparing element 17 as measurement data DAT.

[0011]In the comparing element 17, measurement data DAT given from ADC16 is compared with the reference value REF currently held at the register 19, and when judged with this measurement data DAT being over the reference value REF, the alarm signal ALM is outputted. The alarm signal ALM is given to the alarm part 20, and a beep sound is outputted via the loudspeaker 21 from this alarm part 20. Scanning signal SCN given to the tuner 12 from the received frequency control section 13 is a signal which scans sequentially frequency ranges, such as 800 MHz bands used with a cellular phone, and 1.9 GHz bands, for example, and is received. Therefore, it is judged whether these zones are searched for every constant period, and the electric wave F of the intensity exceeding the reference value REF exists. In frequency ranges, such as 800 MHz bands and 1.9 GHz bands, in the level of the electric wave F inputted into the antenna 11, if it is below the reference value REF altogether, the alarm signal ALM will not be outputted from the comparing element 17, and a beep sound will not be outputted from the loudspeaker 21.

[0012]However, it is near those who are carrying the fault-radio-waves warning device, and if others use a portable telephone, the electric wave F discharged from that portable telephone will be inputted into the antenna 11 of this fault-radio-waves warning device by the intensity beyond the reference value REF, for example. And when the tuner 12 is aligned with the frequency of the electric wave F of the intensity exceeding this reference value REF, the alarm signal ALM is outputted from the comparing element 17 by scanning signal SCN from the received frequency control section 13, and a beep sound is outputted from the loudspeaker 21. Those who are carrying the fault-radio-waves warning device can know that the powerful

electric wave F exists by the beep sound, and can avert a risk of separating from the user of a portable telephone, etc. As mentioned above, the fault-radio-waves warning device of this 1st embodiment, The frequency range used with a cellular phone etc. is scanned, and since it has the tuner 11 for measuring the intensity of the electric wave F, the received frequency control section 13, the detection section 15, ADC16, and the comparing element 17, existence of fault radio waves can be known by a beep sound. It enables this to take the protection measure for avoiding malfunction of the artificial cardiac pacemaker by fault radio waves, etc.

[0013]The 2nd embodiment drawing 2 is a lineblock diagram of the fault-radio-waves warning system in which a 2nd embodiment of this invention is shown, and common numerals are given to the element in drawing 1, and the common element. This fault-radio-waves warning system comprises the fault-radio-waves warning device 10 carried in order that those who are using the artificial cardiac pacemaker may, for example, avoid danger, such as malfunction of the artificial cardiac pacemaker by powerful electromagnetic waves, and the radio-transmission-and-reception devices 30, such as a portable telephone which is a source of release of fault radio waves. Although the fault-radio-waves warning device 10 is the almost same composition as the fault-radio-waves warning device of a 1st embodiment shown in drawing 1, it replaces with the alarm part 20 and the loudspeaker 21 in drawing 1, and the transmitting means (for example, the alarm transmission section 22 and the antenna 23) is established. The alarm transmission section 22 is for outputting weak alarm signal f_{ALM} in which a level is lower than the reference value REF with a specific radio frequency, and the antenna 23 sending the alarm signal f_{ALM} to the circumference, when the alarm signal ALM is given from the comparing element 17. Other composition is the same as that of the fault-radio-waves warning device of drawing 1.

[0014]On the other hand, the radio-transmission-and-reception device 30 has a transmission and reception means (for example, the transmission section 31 and the receive section 32) for transmitting and receiving the frequency of the zone of 800 MHz bands, 1.9 GHz bands, etc., for example. The transmission section 31 is connected to the antenna 34 via the transmission control means (for example, transmission control part) 33, and the receive section 32 is connected to this antenna 34. While the transmission control part 33 carries out ON-and-OFF control of the connection between the transmission section 31 and the antenna 34 based on transmission control signal TCS and this transmission control signal TCS is given, the antenna 34 is separated from the transmission section 31. The radio-transmission-and-reception device 30 has the antenna 36 for alarm signal f_{ALM} reception, and the reception means (for example, alarm receive section) 37 is connected to this antenna 36. The alarm receive section 37 has a function which outputs transmission control signal TCS to the transmission control part 33, when alarm signal f_{ALM} is detected out of the radio signal given from the antenna 36 and this

alarm signal f_{ALM} is detected. Next, operation is explained. If the radio-transmission-and-reception device 30 starts communication and the electric wave F is discharged via the transmission control part 33 and the antenna 34 from the transmission section 31, this electric wave F will be received by the fault-radio-waves warning device 10 near that radio-transmission-and-reception device 30.

[0015]In the fault-radio-waves warning device 10, alarm signal f_{ALM} is transmitted via the antenna 23 based on the alarm signal ALM outputted from the comparing element 17 as the intensity of the received electric wave F is beyond the reference value REF from the alarm transmission section 22. Although alarm signal f_{ALM} is a weak electric wave, it has intensity which is certainly received by the alarm receive section 37 of the radio-transmission-and-reception device 30 several meters near the fault-radio-waves warning device 10, for example. In the radio-transmission-and-reception device 30, the alarm receive section's 37 reception of alarm signal f_{ALM} will output transmission control signal TCS to the transmission control part 33. Thereby, connection between the transmission section 31 and the antenna 34 is cut, and the output of the electric wave F from the antenna 34 is stopped. As mentioned above, the fault-radio-waves warning system of this 2nd embodiment, The alarm transmission section 22 and the antenna 23 for transmitting alarm signal f_{ALM}, when the electric wave F acting as [the fault-radio-waves warning device 10 side] an obstacle is detected are formed, When this alarm signal f_{ALM} is received to the radio-transmission-and-reception device 30 side, the transmission control part 33 for stopping transmission of the electric wave F is formed. Since the electric wave F acting as an obstacle can be stopped by this, the damage caused by fault radio waves can be prevented certainly. This invention is not limited to the above-mentioned embodiment, but various modification is possible for it. As this modification, there is a thing like following (a) - (h), for example.

[0016](a) It is not necessary to form the input part 18 without the necessity of carrying out the setting variation of the reference value REF. Thereby, the simplification of the fault-radio-waves warning device of drawing 1 or the fault-radio-waves warning device 10 of drawing 2 is attained.

(b) The method of the warning to the person having of the fault-radio-waves warning device of drawing 1 is not limited to a beep sound, but it may be made to perform it by vibration or synthesized speech.

(c) The received frequency by the tuner 12 is not limited to 800 MHz bands, 1.9 GHz bands, etc. of a cellular phone, for example, it may be made to receive the citizens' band of 27 MHz bands, etc. It enables this to warn to the fault radio waves of the frequency of the wide range.

(d) Although the transmission control part 33 carries out ON-and-OFF control of the connection

between the transmission section 31 and the antenna 34, it may reduce the transmission power from the transmission section 31 below on a predetermined level.

[0017](e) It has composition which unified the transmission control part 33 and the transmission section 31, and transmission control signal TCS may be made to perform reduction or a stop of transmission power. Thereby, the power consumption at the time of a transmission control can be stopped.

(f) It is not necessary to form individually the antennas 11 and 23 of the fault-radio-waves warning device 10, or the antennas 34 and 36 of the radio-transmission-and-reception device 30, respectively, and they can be shared for every device.

(g) The fault-radio-waves warning device 10 may have only the alarm transmission section 22 and the antenna 23. It becomes possible to the nearby radio-transmission-and-reception device 30 to control transmission a priori regardless of the existence of discharge of the electric wave F by this, and fault radio waves can be avoided certainly.

(h) The same alarm part 20 and loudspeaker 21 as a fault-radio-waves warning device of drawing 1 may be added to the fault-radio-waves warning device 10 of drawing 2. It enables this to warn of the electric wave F from a radio-transmission-and-reception device without neither the alarm receive section 37 nor the transmission control part 33 by a beep sound like the conventional portable telephone.

[0018]

[Effect of the Invention]As explained to details above, according to the 1st invention, it has a reception means which scans the radio signal of a predetermined frequency range and is received one by one, a comparison means [reference value / signal level / the / which was received], and a warning means which emits warning based on a comparison result. Thereby, since it is warned of existence of the radio signal beyond a reference value, it becomes possible to devise required measures. According to the 2nd invention, since it has the input part and storage parts store for setting up a reference value, it becomes possible to set up a suitable reference value according to an operating environment. According to the 3rd invention, it has the radio-transmission-and-reception device which has a transmission control means for reducing or stopping the fault-radio-waves warning device which transmits an alarm signal, and the level of the radio signal transmitted when this alarm signal is received. Thereby, it becomes possible to stop fault radio waves certainly. According to the 4th invention, it has the radio-transmission-and-reception device which has a transmission control means for reducing or stopping the level of the fault-radio-waves warning device which transmits an alarm signal only when the intensity of the received electric wave exceeds a reference value, and the radio signal transmitted when this alarm signal is received. It is lost that this controls transmission of a radio-transmission-and-reception device superfluously, and influence on the radio-transmission-and-reception device side can be lessened.

[Translation done.]

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DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1]It is a lineblock diagram of the fault-radio-waves warning device in which a 1st embodiment of this invention is shown.
[Drawing 2]It is a lineblock diagram of the fault-radio-waves warning system in which a 2nd embodiment of this invention is shown.
[Description of Notations]
10 Fault-radio-waves warning device
11, 23, 34, and 36 Antenna
12 Tuner
13 Received frequency control section
14 BPF (band-pass filter)
15 Detection section
16 ADC (analog-to-digital conversion machine)
17 Comparator
18 Input part
19 Register
20 Alarm part
21 Loudspeaker
22 Alarm transmission section
30 Radio-transmission-and-reception device
31 Transmission section
32 Receive section
33 Transmission control part
35 Control section
37 Alarm receive section

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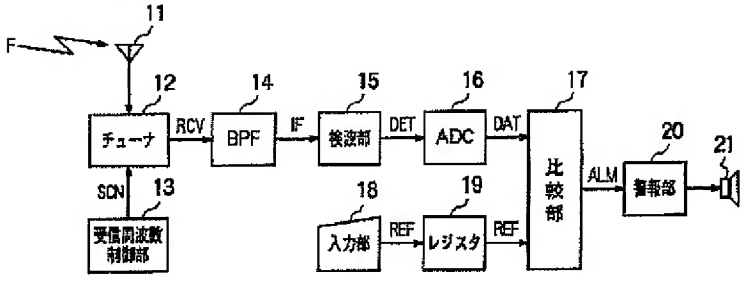
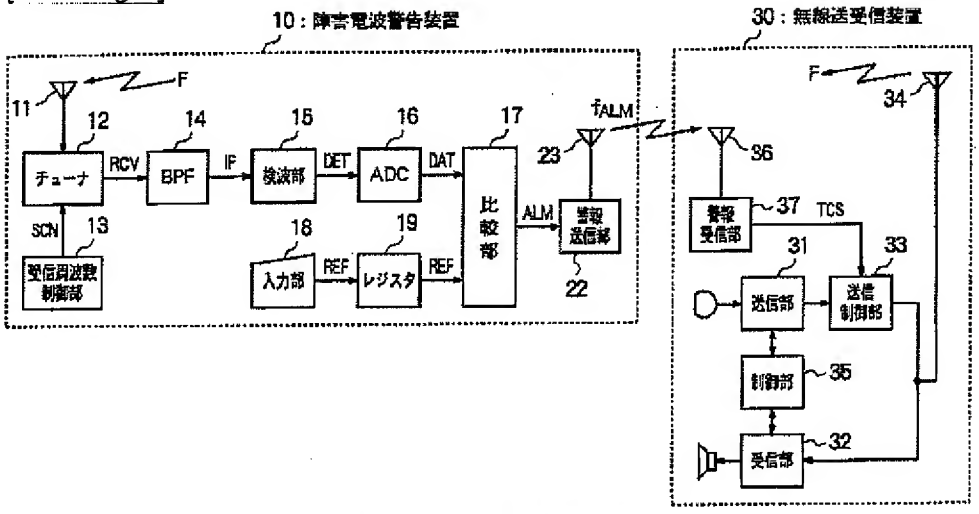
DRAWINGS

[Drawing 1]



本発明の第１の実施形態の障害電波警告装置

[Drawing 2]



本発明の第２の実施形態の障害電波警告システム

[Translation done.]